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(54) Portable printing apparatus.

(57) The apparatus comprises a bearing structure (2), a slidably movable print head (6) guided in said bearing structure, a dragging unit (22, 33) adapted to move a sheet (7) to be printed under the print head and exhibiting dragging members (22) directly acting on the sheet, a plate-like body (4) provided with a write surface (5) located under the print head and representing a rest surface for the sheet, the bearing surface being oscillatable relative to the plate-like body between an operating position in which the bearing surface and plate-like body are substantially in mutual contact and a raised position for putting the sheet in place, in which the dragging members directly acting on the sheet are located in the plate-like body substantially below the write surface.

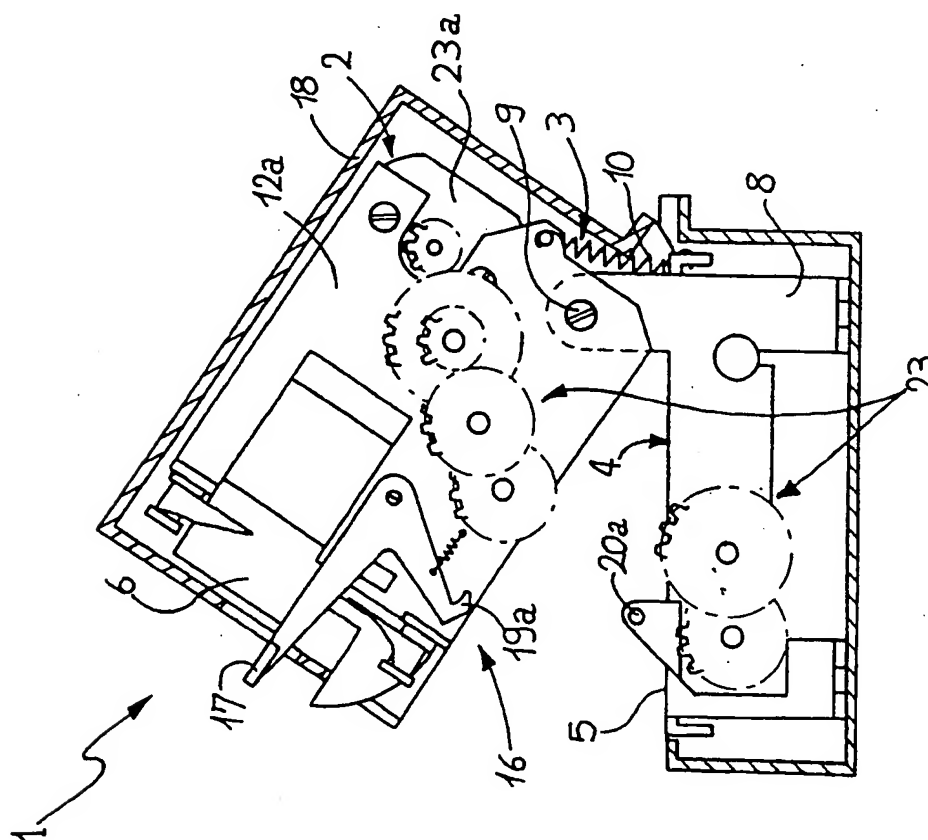


FIG. 3

EP 0 448 519 A1

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# PORTABLE PRINTING APPARATUS

The present invention relates to a portable printing apparatus.

It is known that nowadays it is increasingly more often necessary to resort to practical and handy data processing apparatus to be used in any circumstance for example in order to draw invoices, standardized forms or documents directly in the place in which they are required. For these data processing apparatus, printers of the portable type have been produced which substantially comprise a bearing structure, a print head slidably movable in the bearing structure and a dragging unit exhibiting dragging members adapted to move a sheet to be printed under the print head.

Portable printing apparatus of known type have however many limits and drawbacks.

In fact they achieve the main intended aim, that is an easy transportability, only to a limited extent because the sizes and weight of the bearing structure they are provided with are not sufficiently reduced.

In addition the print accuracy does not always reach a completely acceptable level and, when this level is obtained, the apparatus weight is greatly affected.

It is also to be pointed out that the print quality, above all as far as copies underneath the main sheet are concerned, is many times poor and the print operation itself is not always noiseless enough.

Under this situation, the technical task underlying the present invention is to devise a portable printing apparatus capable of substantially eliminating the above drawbacks.

Within the scope of this technical task it is an important object of the invention to devise a printing apparatus enabling to combine a high print accuracy and quality even in the copies with a greatly reduced bulkiness and weight.

A further object of the invention is to provide an embodiment of the invention which is advantageous in itself while representing a technical improvement in the specific field.

The above specified technical task and objects and still further objects that will become more apparent in the following description are substantially achieved by a portable printing apparatus of the type comprising: a bearing structure; a print head slidably movable and guided within said bearing structure; a dragging unit adapted to move a sheet to be printed under said print head and exhibiting dragging members directly acting on said sheet, characterized in that the portable printing apparatus further comprises: a plate-like body in which a write surface located underneath said print head and adapted to rest on said sheet to be printed is provided; hinge means for oscillatably connecting the bearing structure to the

plate-like body according to a substantially horizontal axis, form an operating position in which they are in mutual contact to a raised position for the positioning of said sheet, said dragging members directly acting on said sheet being disposed in said plate-like body substantially below said write surface.

The following description of some preferred embodiments of a portable printing apparatus in accordance with the invention is given hereinafter by way of non-limiting example with reference to the accompanying drawings, in which:

- Fig. 1 is a partly sectional front view of the apparatus of the invention;

- Fig. 2 is a side view of the apparatus in an operating position, showing the apparatus housing in section;

- Fig. 3 represents the same view as shown in Fig. 2 but in a raised position for the introduction of a sheet thereinto;

- Fig. 4 is a sectional view of the apparatus taken along line IV-IV in Fig. 1 provided with one type of dragging members;

- Fig. 5 is a sectional view of the apparatus taken along line IV-IV in Fig. 1 provided with a second type of dragging members.

Referring to the drawings, the portable printing apparatus in accordance with the invention is generally identified by reference numeral 1. It comprises a bearing structure 2 oscillatably engaged according to a substantially horizontal axis, through hinge means 3, to a plate-like body 4, in which a substantially flat write surface 5 is formed which is disposed underneath a print head 6 known per se. A sheet 7 to be printed, which may be a single sheet or consist of an endless form is adapted to rest on the write surface 5.

The hinge means 3 comprises a pair of brackets 9 integral with the plate-like body 4, articulated with screws 9 and a spring 10 to keep the bearing structure 2 in a raised position.

The bearing structure 2 essentially comprises a stiff rod 11, substantially having a hollow circular section and on which the print head 6 is slidably movable, and a pair of flattened side elements 12a and 12b between which the stiff rod 11 is comprised and to which it is engaged, at its ends, by means of extensions 13 integral with the rod itself and spaced apart from the axis thereof. The extensions 13 are in turn fastened to the flattened side elements 12a and 12b. In this manner the stiff rod 11 is prevented from rotating and the side elements 12a and 12b are secured exactly in a mutually parallel position.

Provided above the stiff rod 11 is a guide crosspiece 14 parallel to the stiff rod and engaged to the side elements 12a and 12b, along which the print head 6 is guided through guide means 15 such as slid-

ing rollers for example.

The bearing structure 2 can be clamped to the plate-like body 5 in an operating position in a rigid manner, as shown in Fig. 2, by closure means 16 comprised of: a lever 17 disposed externally to one of the side elements 12a, 12b, operable by hand and protruding from a housing 18 which, divided into two portions, closes both the bearing structure 2 and the plate-like body 4; a first hooked element 19a integral with or connected to the lever 17 and a first restraining element 20a, engaged to the plate-like body 4 and designed to be hooked by the first hooked element 19a. The latter is rigidly connected through a stem 21 passing through the rigid rod 11, to a second hooked element 19b located externally to the side element 12b and in turn adapted to be hooked to a second restraining element 20b secured to the plate-like element 4 as well.

Apparatus 1 also comprises a dragging unit adapted to move the sheet 7 to be printed under the print head 6 and exhibiting dragging members 22 directly acting on the sheet 7 and originally disposed in the plate-like body 4 substantially underneath the write surface 5.

The dragging members 22 are moved by a gearing 23 comprised of toothed wheels disposed partly in the bearing structure 2 and partly in the plate-like body 4, in turn operated by an electric motor 23a being part of a drive unit not shown as known per se, located within the bearing structure 2.

The kinematic chain defined by gearing 23 is interrupted when the bearing structure 2 is raised and becomes automatically engaged when the bearing structure is lowered to take the operating position.

Connected to the lower part of the bearing structure 2 is an upper plate 24 substantially matching the shape of the write surface 5 and disposed above the latter so that the sheet 7 is comprised between the write surface 5 and the plate 24 in the operating position.

In one embodiment, shown in Fig. 4, the dragging members comprise a pair of rotating elements 25 of the so-called "sprocket type", cog belts for example, disposed spaced apart from each other in a position close to the side elements 12a, 12b. On the upper side the rotating elements 25 substantially project flush with the write surface 5 through appropriate passageways 25a formed in the plate-like body 4. The rotating elements 25 are each provided with outer teeth 26 partly passing through slits 27 formed in the plate 24 and adapted to engage into corresponding edge perforations in the sheet 7, as well as with inner teeth 28 for causing a drive roller 30 fitted on a square-section shaft 31 moved by the gearing 23 to drive an idler roller 29.

The plate 24 is preferably provided, closed to at least one of its side edges, with a pair of slits 27 disposed in side by side relation, adapted to be selec-

tively passed through at least partly by the outer teeth 26 if it is provided that the rotating toothed elements 25 and corresponding rollers 29 and 30 should be positioned spaced apart from each other or close to each other depending upon the width of the sheets 7 to be printed.

In a second embodiment, shown in Fig. 5, the dragging members 22 are comprised of a number of friction rollers 32, suitably disposed spaced apart from the square-section shaft 31. The upper part of the friction rollers 32 substantially protrudes flush with the write surface 5 through suitably passageways 32a. According to this construction solution, the plate 24 has a number of apertures 33 in register with the friction rollers 32, which apertures are passed through by a number of friction counter-roller 34 operating against the spring action of the friction roller 32 and engaged to the plate 24 by means of flat springs 35.

Advantageously, in register with the write line of the print head 6 there is a strip 36 of elastomeric material, preferably adiprene, engaged to the write surface 5.

Operation of the portable printing apparatus in accordance with the invention described above mainly as regards structure is as follows.

After operating the lever 17 the overturning of the bearing structure 2 is carried out, said structure taking a raised position by virtue of spring 10. The bearing structure being in this position, the user can easily out the paper consisting of a single sheet or an endless form, in place on the write surface 5. In fact, above all in the case of use of dragging members of the "sprocket" type, the visibility of the paper transport area and the access thereto make the correct feeding of the paper into the printer very easy.

Subsequently the bearing structure 2 is lowered to the operating position and the closure means 16 clamps the bearing structure 16 to the plate-like body 4 by snap fitting, thereby forming a very stiff single block.

The sheet 7 is thus located between the plate 24 and the write surface 5.

If the embodiment shown in Fig. 5 is used, the sheet is pressed against the friction rollers 32 by pressing counter-rollers 34.

The invention attains the intended purposes and achieves important advantages.

In fact the bearing structure 2 is very light-in-weight and shift. Possible small geometrical unevennesses present in the plate-like body 4 are perfectly corrected by the clamping carried out through the closure means 16 between the plate-like body 4 itself and the bearing structure 2. It is therefore possible to achieve a high accuracy.

It is also to be pointed out that the particular arrangement of the dragging members enables the apparatus bulkiness to be further reduced.

Finally it will be recognized that the adiprene strip

36 surprisingly allows the noise of the apparatus in operation to be greatly reduced, the lifetime of the print ribbon to be enhanced and a perfect writing to be achieved even when copies under the main sheet are provided.

In addition the strip 36 has a long lifetime event if, unlike the traditional rotating rollers, it is continuously stressed.

The particular embodiment shown is advantageous also in its most specific aspects.

Modifications and variations may be made, all of them falling within the scope of the inventive idea. In addition, all of the details may be replaced by technically equivalent elements.

In the practical accomplishment of the invention the materials used, forms and sizes can be of any nature and magnitude in accordance with requirements.

## Claims

1. A portable printing apparatus comprising:
  - a bearing structure (2);
  - a print head (6) slidably movable and guided within said bearing structure (2);
  - a dragging unit (22, 23) adapted to move a sheet (7) to be printed under said print head (6) and exhibiting dragging members (22) directly acting on said sheet (7), characterized in that said portable printing apparatus further comprises:
    - a plate-like body (4) in which a write surface (5) located underneath said print head (6) and adapted to rest on said sheet (7) to be printed is provided;
    - hinge means (3) for oscillatably connecting the bearing structure (2) to the plate-like body (4) according to a substantially horizontal axis, from an operating position in which they are in mutual contact to a raised position for the positioning of said sheet (7),
  - said dragging members (22) directly acting on said sheet (7) being disposed in said plate-like body (4) substantially below said write surface (5).
2. An apparatus according to claim 1, characterized in that said bearing structure (2) comprises:
  - a stiff rod (11) slidably carrying said print head (6),
  - two flattened side elements (12a, 12b) between which the stiff rod (11) is rigidly engaged at the respective ends thereof, and
  - at least an upper guide crosspiece (14) to guide said print head (6) and engaged to said side elements (12a, 12b).
3. An apparatus according to claim 1, characterized in that closure means (16) adapted to rigidly clamp the bearing structure (2) to said plate-like body (4) in the operating position is provided.
4. An apparatus according to claim 3, characterized in that said closure means (16) comprises at least a lever (17) operable by hand, at least a hooked element (19a) connected to said lever (17), and a restraining element (20a) adapted to come into engagement with said hooked element (19a).
5. An apparatus according to claim 4, characterized in that said bearing structure (2) comprises a stiff rod (11) slidably carrying said print head (6) and two substantially flat side elements (12a, 12b) between which the stiff rod (11) is rigidly engaged, and in that two of said hooked elements (19a, 19b) are provided, each of them close to one of said side elements (12a, 12b), as well as a stem (21) for the mutual engagement between said hooked elements (19a, 19b) passing through the inside of said stiff rod (11).
6. An apparatus according to claim 2, characterized in that said stiff rod (11) exhibits, at each end thereof, at least an extension (13) extending away from its axis and adapted to be engaged to the adjacent side element (12a, 12b) thereof.
7. An apparatus according to claim 1, characterized in that said dragging unit (22, 23) comprises a drive unit (23a) located in said bearing structure (2) and a gearing (23) to transmit the motion from said drive unit (23a) to said dragging members (22), said gearing (23) being disposed partly in said bearing structure (2) and partly in said plate-like body (4) and being adapted to become automatically engaged when the bearing structure (2) is lowered to its operating position.
8. An apparatus according to claim 1, characterized in that said dragging members (22) are comprised of a pair of rotating elements (25) located spaced apart from each other in a position close to said side elements (12a, 12b) and adapted to engage with corresponding edge perforations of the sheet (7), and in that an upper plate (24) is provided which is engaged at the lower part thereof to said bearing structure (2) and substantially matches the shape of the write surface (5), said sheet (7) being included between said upper plate (24) and write surface (5) in said operating position.
9. An apparatus according to claim 8, characterized in that said rotating toothed elements (25) are selectively movable away from or close to each other depending upon the width of the sheet (7) to be printed, and in that said upper plate (24)

exhibits, close to at least one of its side edges, at least a pair of slits (27) substantially disposed in side-by-side relation and adapted to be selectively passed through at least partly by the corresponding rotating toothed element (25).

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10. An apparatus according to claim 1, characterized in that said dragging members (22) comprise a number of friction rollers (32) and in that provision is made for:

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- an upper plate (24) engaged at the lower part thereof to said bearing structure (2), substantially matching the shape of the write surface (5) and having a number of apertures (32a) in register with said friction rollers (32), and

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- a number of pressing counter-rollers (34) engaged to said plate (24) disposed in register with said apertures (32a) and acting against the spring action of said friction rollers (32), said sheet (7) being inserted between said upper plate (24), pressing counter-rollers (34) and write surface (5) in said operating position.

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11. An apparatus according to claim 1, characterized in that a strip (36) made of elastomeric material is provided in engagement with said write surface (5) at the write line of the print head (6).

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12. An apparatus according to claim 11, characterized in that said elastomeric material is substantially adiprene.

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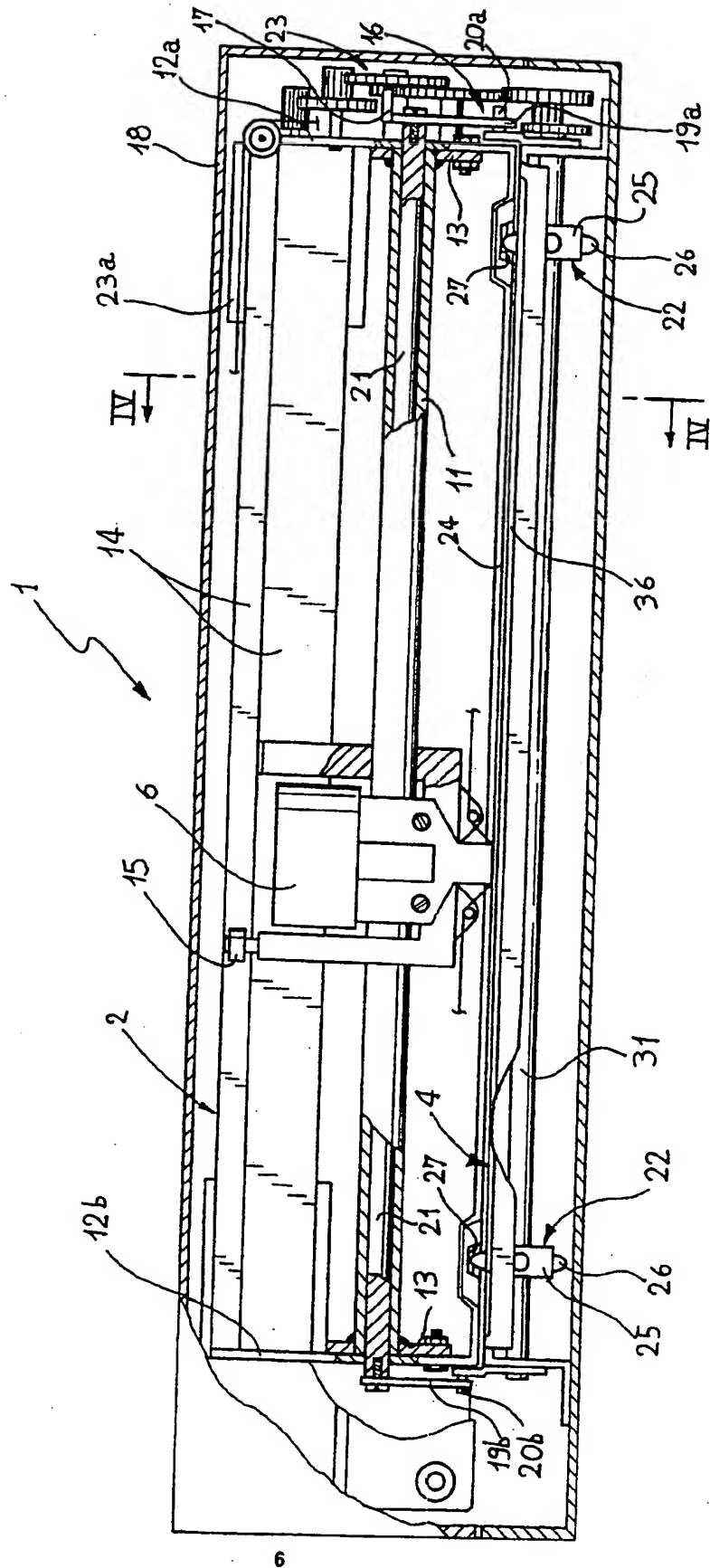
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FIG. 1



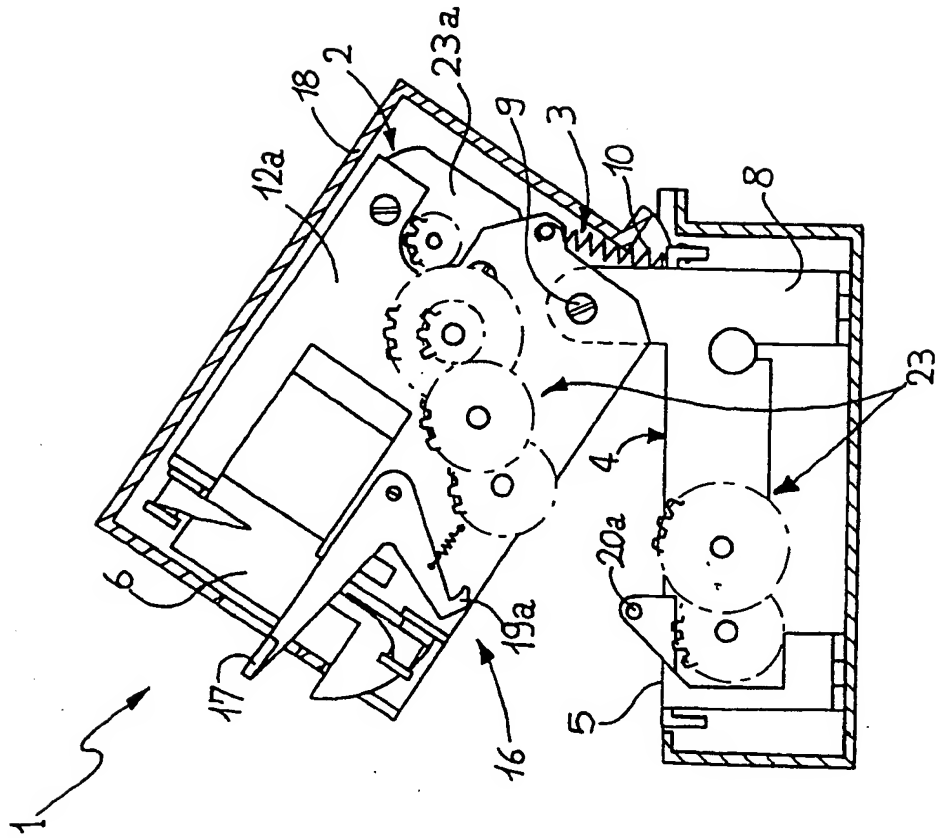


FIG. 3

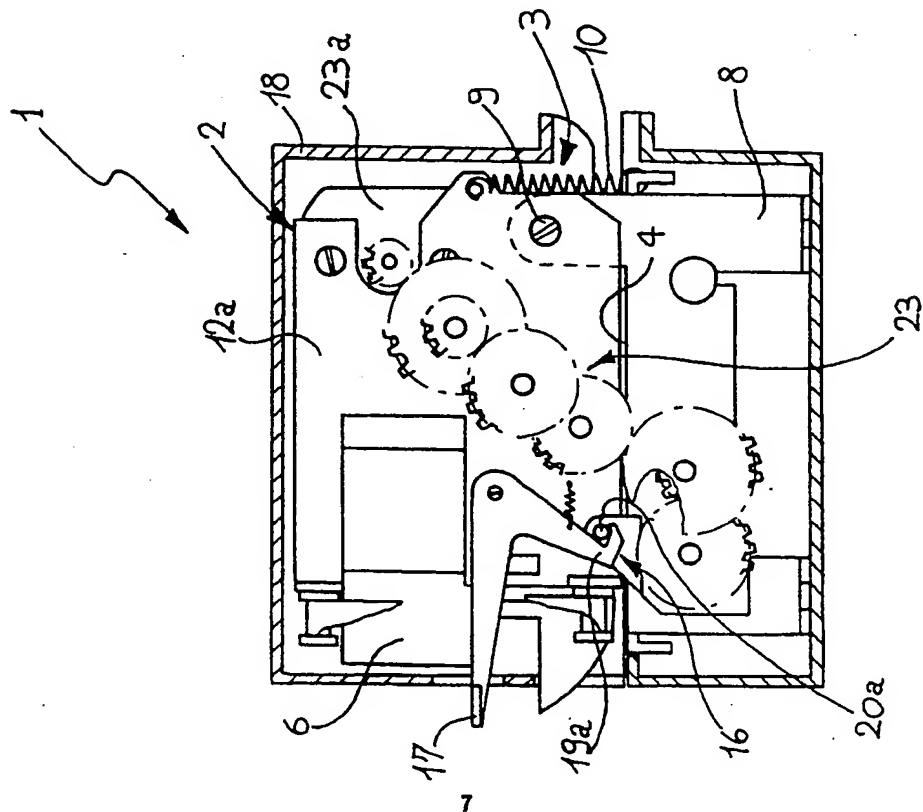


FIG. 2

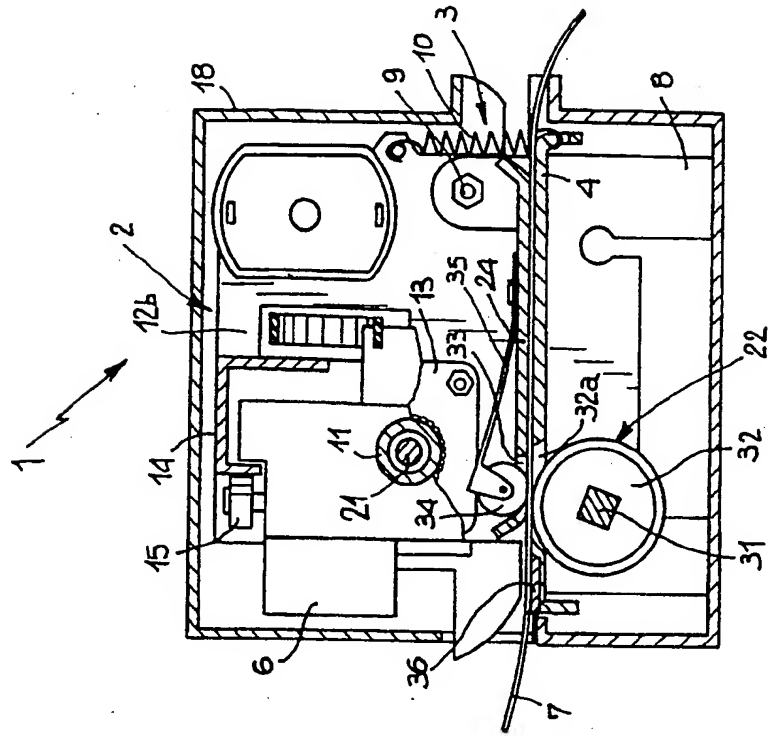


FIG. 5

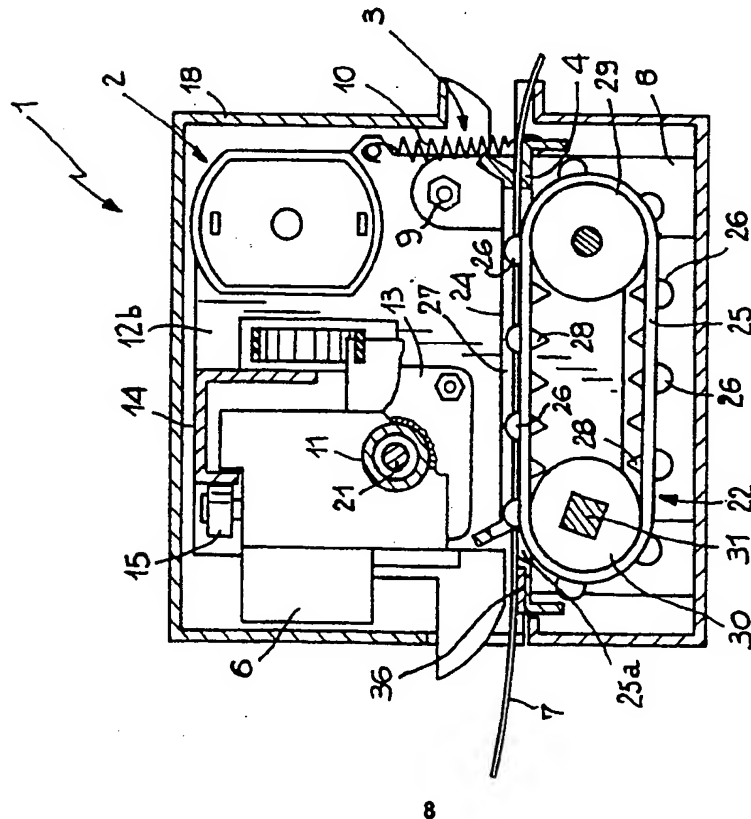


FIG. 4





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# EUROPEAN SEARCH REPORT

Application Number

EP 91 83 0004

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-4531852 (MADGE ET AL) * abstract; figures * * column 2, line 58 - column 5, line 30 * ---	1-4, 8-11	B41J3/36 B41J29/02
A	GB-A-2037665 (SEBASTIAN BAUER KG) * page 3, lines 55 - 70; figures 3, 6 * * page 4, lines 112 - 122 * ---	1, 3, 10	
A	US-A-4689639 (KIMURA ET AL) * abstract; figures 2a, 2b, 4, 5 * * column 4, line 16 - column 5, line 11 * ---	1, 7, 10	
A	US-A-4725853 (KOBAYASHI ET AL) * abstract; figures 9-12 * ---	11, 12	
A	EP-A-271090 (CANON K.K.) * abstract; figures 2-4, 19-22 * * column 13, line 5 - column 14, line 11 * * column 28, line 1 - column 30, line 18 * -----	1, 10	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B41J B65C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 16 MAY 1991	Examiner ROBERTS N.
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone  Y : particularly relevant if combined with another document of the same category  A : technological background  O : non-written disclosure  P : intermediate document</p> <p>T : theory or principle underlying the invention  E : earlier patent document, but published on, or after the filing date  D : document cited in the application  I : document cited for other reasons  .....  A : member of the same patent family, corresponding document</p>			

EPO FORM 1503 (04/92) (P0401)

